

Appl. No. 10/541,624
Amdt. Dated July 17, 2007
Reply to Office Action of April 20, 2007

REMARKS

Claims 1 to 17 are currently pending in the present application. Claims 1, 11, 13, 14 and 15 are amended herein. No new matter is added by the amendments to the claims.

Claim 14 stands objected to because "the cardiac system" lacks sufficient antecedent basis. Claim 14 has been amended to claim "the instrument tracking system of claim 13, wherein the periodic internal movement of the body is caused by a cardiac system".

Claim 15 stands objected to because "the respiratory system" lacks sufficient antecedent basis. Claim 15 has been amended to claim "the instrument tracking system of claim 13, wherein the periodic internal movement of the body is caused by a respiratory system".

It is respectfully submitted that the term "cardiac system" of claim 14 and the term "respiratory system" of claim 15 now have proper antecedent basis. Withdrawal of the rejections of claims 14 and 15 is earnestly solicited.

Claims 1 to 17 stand rejected by the Action under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Application No. 2002/0049375A1 to Strommer et al. (hereinafter "Strommer"). Applicants respectfully submit that Strommer does not

Appl. No. 10/541,624
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expressly or inherently disclose all of the elements set forth in independent claim 1.
Thus, Strommer does not anticipate claim 1 or claims 1 to 10, which depend therefrom.

Claim 1 claims a method of tracking an instrument that is inserted into the body of a patient using only 2-D imagery, the method comprising the steps of: a) detection of a movement signal which represents the movement phases of a periodic internal movement of the body; b) generation of 2D images of a body volume of interest, and storage thereof in an image database together with the associated imaging parameters and the associated movement phase; c) measurement of the spatial position of the instruments; d) selection of at least one 2D image from the image database, which 2D image corresponds in terms of its associated movement phase to the movement phase belonging to the measured spatial position of the instrument; e) determination of the position of the instrument on the selected 2D image.

It is an object of the invention to simplify the tracking of the position of an instrument, so that it can be integrated more easily with the working procedure of an investigation and preferably permits real-time updating of the images during the intervention. The method of claim 1 has the advantage that the movement of the instrument is tracked exclusively using 2D images, which are produced anyway during the conventional procedure of medical (catheter) investigations. It is therefore seldom necessary to use additional equipment. On account of the simultaneous storage of imaging parameters, movement phases and 2D images in the image database, it is possible, during an operative intervention that is in progress, to represent the current

Appl. No. 10/541,624
Amdt. Dated July 17, 2007
Reply to Office Action of April 20, 2007

spatial position of the instrument on that 2D image from the image database which corresponds to the current movement phase. Displacements and changes in shape of organs of the body on account of periodic internal movements can in this way be taken into consideration or compensated for. Furthermore, movements of the patient as a whole or of the table on which the patient is lying can also be taken into consideration or compensated for.

Strommer fails to disclose the invention of claim 1. Specifically, Strommer fails to disclose a method of tracking an instrument that is inserted into the body of a patient, using only 2-D imagery. Rather, Strommer discloses methods and systems for constructing and displaying three-dimensional images of moving organs, synchronously with the movement of such organs and synchronously with an invasive tool. Specifically, the imaging system disclosed by Strommer operates by reconstructing a three-dimensional image from recorded two-dimensional images, which have the same organ timing signal reading (from different cycles). When the reconstructed three-dimensional images include sufficient information, the system displays a sequence of these three-dimensional images, synchronized with a real-time reading of the organ timing signal, thereby providing a real-time visualization of the inspected organ.

A disadvantage of the Strommer method is the high expenditure associated with reconstruction of a three-dimensional image. Three-dimensional images of the organ first have to be produced using X-ray computer tomography or magnetic resonance imaging, which not only takes a great deal of time but also greatly modifies the conventional

Appl. No. 10/541,624
Amdt. Dated July 17, 2007
Reply to Office Action of April 20, 2007

working procedures of a catheter laboratory, since the necessary imaging methods are not generally available in the catheter laboratory. Thus the taking of the images requires an additional time-intensive step. Furthermore, the time-intensive 3D imaging methods generally do not permit real-time updating of the 3D image during the intervention.

Claims 2 to 10 depend from claim 1 and provide further features, thus claims 2 to 10 are distinguishable over Strommer for at least the reasons discussed.

Claim 11 has been amended to claim an arrangement for tracking an instrument that is inserted into the body of a patient using only 2-D imagery, the arrangement comprising: a) a device for generating 2D images of a body volume of interest; b) a unit for determining the set imaging parameters of the device; c) a signal measurement unit for detecting a movement signal which represents movement phases of a periodic internal movement of the body; d) a storage unit for storing an image database of 2D images of the body volume together with the associated imaging parameters and the associated movement phases; e) a position measurement unit for determining the spatial position of the instrument that is inserted into the body; d) a control and computation unit for selecting at least one 2D image from the image database, which 2D image corresponds in terms of its associated movement phase to the movement phase belonging to the spatial position of the instrument, and for determining the position of the instrument on the selected 2D image.

Appl. No. 10/541,624
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Claim 13 has been amended to claim an instrument tracking system for tracking an instrument that is inserted into the body of a patient using only 2-D imagery, the instrument comprising: a) a means for generating and storing 2D images of a volume of interest in a body prior to insertion of an instrument into the body; b) a means for measuring movement phases of a periodic internal movement of the body; c) a means for correlating said 2D images with said movement phases; d) a means for tracking the position of the instrument upon insertion into the body; e) a means for selecting a stored 2D image based on real-time measurement of the movement phases; and f) a means for superimposing the position of the instrument with the selected 2D stored image.

Claim 11 and 13, similar to claim 1, have been amended to claim an arrangement and an instrument for tracking an instrument that is inserted into the body of a patient, using only 2-D imagery. Accordingly, claims 11 and 13 are patentable over Strommer for at least the reasons discussed with respect to claim 1. Claim 12, depending from claim 11, is also patentable over Strommer. Claims 14 to 17 depend from claim 13 and are patentable over Strommer for the reasons discussed.

Accordingly, the Applicants respectfully request that the rejections under 35 U.S.C. § 102(b) of claims 1 to 17 be withdrawn. Allowance of claims 1 to 17 is earnestly solicited.

Appl. No. 10/541,624
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Conclusion

In view of the foregoing, Applicants respectfully submit that the specification, the drawings and all claims presented in this application are currently in condition for allowance. Accordingly, Applicants respectfully request favorable consideration and that this application be passed to allowance.

Should any changes to the claims and/or specification be deemed necessary to place the application in condition for allowance, the Examiner is respectfully requested to contact the undersigned to discuss the same.

Applicants' representative believes that this response is being filed in a timely manner. In the event that any extension and/or fee is required for the entry of this amendment the Commissioner is hereby authorized to charge said fee to Deposit Account No. 14-1270. An early and favorable action on the merits is earnestly solicited.

If the Examiner should have any questions concerning this communication or feels that an interview would be helpful, the Examiner is requested to call David Barnes, Esq., Intellectual Property Counsel, Philips North America Corporation at the number below.

Appl. No. 10/541,624
Amdt. Dated July 17, 2007
Reply to Office Action of April 20, 2007

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